United States Department of Agriculture

Final Report

Title:	Testing the Efficacy of Insecticides and Fungicides Allowed for Organic Vegetable Production

Sponsoring Agency	NIFA	**Project Status**	COMPLETE
Funding Source	Hatch	**Reporting Frequency**	Final
Accession No.	1001267	**Project No.**	NYC-106401
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Submitted By	Crystal Clark	**Date Submitted to NIFA**	01/12/2017

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Performing Department

CCE Integrated Pest Mgmt

Non-Technical Summary

While organic certification standards and practice prescribe an approach to pest management that integrates soil health, rotation, resistant varieties, and other cultural practices, damage from certain pests is still present at levels requiring intervention in many years. Efficacy information on many products allowed for organic production is scarce and difficult for farmers to find. Organic vegetable farmers and those contemplating a transition to organic need reliable information on the effectiveness of the products they are allowed to use. In addition, new products are coming on the market for which objective efficacy information is not available. This project addresses this issue by testing the efficacy of insecticides and fungicides allowed for organic production against high-priority pests identified by organic vegetable farmers in New York.

Accomplishments

Major goals of the project

The goal of this project is to provide organic vegetable farmers with information on the effectiveness of insecticide and fungicides allowed for organic production. This information will help existing organic farmers be more profitable by increasing marketable yield and quality, and allow farmers considering a transition to organic to assess their risks of crop loss from insect and disease pests.

What was accomplished under these goals?

We generated data on the efficacy of insecticides and fungicides allowed for organic production against five insect and disease pests that organic farmers have identified as important production challenges. Links to published reports are supplied where available.

2014

Swede midge, diamondback moth and imported cabbwormon broccoli: Treatments included Azera at 3.5 pt/A, Grandevo at 3 lb./A, Surround at 0.5 lb./gal, Venerate at 4 qt/A, Veratran at 15 lb/A, a Nu-film P only control, and an untreated control.
http://amt.oxfordjournals.org/content/40/1/E48

Striped cucumber beetle and squash bug on zucchini: Treatments included: Azera at 3.5 pt/acre, Grandevo at 2 lb/acre, Venerate, Veratran at 15 lb/acre, Surround at 0.5 lb/gal, and an untreated control.
http://amt.oxfordjournals.org/content/40/1/E49

Cercospora leaf spot on beets: Treatments included Cueva at 1 gal/A, Actinovate AG at 12 oz/A, Serenade Optimum at 1 lb./A, Cueva plus Serenade, and two disease resistant cultivars.
https://www.plantmanagementnetwork.org/pub/trial/pdmr/volume9/abstracts/v07.asp

2015

Swede midge on broccoli:

Treatments included Azera at 3.5 pt/A, Grandevo at 3 lb./A, Surround at 0.5 lb./gal, Venerate at 4 qt/A, Veratran at 15 lb/A,

and an untreated control. Treatments were initiated 7/7 and repeated for five consecutive weeks. Unfortunately our swede midge population has disappeared from this field. We will conduct trials at a commercial farm with a known infestation next season.

Striped cucumber beetle (SCB) field trial and bioassay:

Treatments included: Azera at 3.5 pt/acre, Grandevo at 2 lb/acre, Venerate, Veratran at 15 lb/acre, Surround at 0.5 lb/gal, and an untreated control.

Field trial: Four flats of six zucchini plants each were sprayed with each treatment. Plants were in the one true leaf stage. Flats were arranged on the surface of the soil in a randomized complete block design, with each flat constituting a replicate. Beetles were allowed to colonize the plants for 48 hours, at which time each flat was photographed to be evaluated for percent leaf area consumed.

Bioassay: Leaf disks were dipped into the solutions used to treat the field trial plants and placed in small, ventilated cages. The Surround treatment was not included in the bioassay. Ten field-collected adult SCB were introduced into each cage and allowed to feed for 48 hours, when live and dead beetles were counted. SCB mortality was 79% in the Azera treatment. No other treatment resulted in significant mortality compared with the untreated control.

Squash bug on zucchini field trial:

Treatments included: Azera at 3.5 pt/acre, Grandevo at 2 lb/acre, Venerate, Veratran at 15 lb/acre, Surround (kaolin clay) at0.5 lb/gal, and an untreated control. Insect colonization of the plots was very uneven so results were not useful.

Fulvia leaf mold on tomato:

Treatments included Actinovate AG (Streptomyces lydicus WYEC 108) at 6 oz/50 gal, Double Nickel (Bacillus amyloliquefaciens strain D747) at 3 lb/A, Regalia (extract of Reynoutria sachalinensis) at 3 pt/5p gal, a mixture of Actinovate and Regalia at the rates stated above, Zonix (Rhamnolipid biosurfactant) at 300 ppm, Oxidate (Hydrogen dioxide) at 1 gal/100 gal, and Nordox (Cuprous oxide) at 1.25 lb/A.

https://www.plantmanagementnetwork.org/pub/trial/pdmr/volume10/abstracts/v014.asp

Cucurbit downy mildew on cucumber:

Treatments included Actinovate AG at 6 oz/50 gal, Double Nickel at 3 lb/A, Regalia at 3 pt/5p gal, a mixture of Actinovate and Regalia at the rates stated above, Zonix at 300 ppm, Oxidate at 1 gal/100 gal, and Nordox at 1.25 lb/A, Champ WG at 0.25 lb/A, and Cueva at 1 gal/100 gal. All treatments resulted in disease levels significantly lower than the untreated control, but none provided commercially viable levels of disease suppression.

https://www.plantmanagementnetwork.org/pub/trial/pdmr/volume10/abstracts/v015.asp

Late blight management on tomato:

Two late blight trials were conducted: one using the late blight Decision Support System (DSS) (http://blight.eas.cornell.edu/blight/) to time copper fungicide (Nordox at 1.25 lb/A) applications on susceptible and moderately resistant varieties and one to test a grower reported practice of alternating copper fungicide and Oxidate applications weekly. The DSS provided equivalent levels of late blight control with five fewer fungicide applications for a susceptible tomato variety and six fewer for a moderately resistant variety. This result reflects the relatively dry conditions of the 2015 growing season and will not hold for all growing seasons.

In the second trial we found that alternating weekly applications of copper fungicide with Oxidate did not provide higher levels of late blight control than biweekly copper fungicide applications.

2016

Swede midge on broccoli: Treatments included Veratran at 15 lb./A, Surround at 0.5 lb./A weekly applications, Surround at 0.5 lb./A applications the first four weeks after planting, Surround at 0.5 lb./A applications the last three weeks before harvest, Aza-Direct foliar at 2 pt/A, Aza-Direct drench at 27 oz/100 gal. and an untreated control. Data analysis is pending, and the report will be submitted to Arthropod Management Tests.

Crucifer flea beetle on cabbage: Treatments included Entrust at 3 oz/A, Azera at 3.5 pt/A, Venerate at 4 qt/A, Grandevo at 3 lb/A, Veratran at 15 lb/A and an untreated control. Flats of plants were treated and placed in a flea beetle infested field, rated for damage one week later, treated again, and rated one week later . Data analysis is pending, and the report will be submitted to Arthropod Management Tests.

Squash bug bioassay: Azera at 3.5 pt/A, Venerate at 4 qt/A, Grandevo at 3 lb/A, Veratran at 15 lb/A, Surround at 0.5 lb./A and an untreated control. Unfortunately mortality in the untreated control treatment was unacceptably high and results are not useful.

Cucurbit downy mildew on cucumber: Treatments included Champ 30 WG at 2 lb/A, Double Nickel LC at 32 fl oz/A, MB-110 at 3 qt/A, Zonix at 38 fl oz/gal, Actinovate AG at 12 oz/50 gal, Regalia EC at 3 pt/50 gal, a tank mix of Actinovate plus Regalia at the above rates, and an untreated control. Treatments were initiated on August 4 and disease first appeared August 22nd. No treatments provided economic levels of control. Submitted to Plant Disease Management Reports.

Cucurbit powdery mildew on zucchini: Treatments included Actinovate AG at 12 oz/A, Double Nickel at 32 fl oz/A, Milstop at 2.5 lb/A, Oxidate 2.0 at 128 fl oz/100 gal, Pomcho at 1% v/v, Oxidate plus Pomcho at the rates listed above, Regalia EC at 4 oz/A, a tank mix of Regalia plus Actinovate at the rates listed above, MB-110 at 4 qt/A, Microthiol Disperss sulfur at 25 lb/A,

and an untreated control. Treatments were initiated before powdery mildew was present. The Sulfur, Milstop, Regalia, and Regalia plus Actinovate treatments provided the highest level of control. Submitted to Plant Disease Management Reports.
Bacterial Speck of Tomato: Treatments included Actinovate AG at 12 oz/A, Double Nickel LC at 32 fl oz/A, Milstop at 2.5 lb/A, Oxidate 2.0 at 128 fl oz/100 gal, Pomcho at 1% v/v, Oxidate plus Pomcho at the rates listed above, Regalia EC at 4 oz/A, a tank mix of Regalia plus Actinovate at the rates listed above, MB-110 at 4 qt/A, Microthiol Disperss sulfur at 25 lb/A, and an untreated control. Submitted to Plant Disease Management Reports.

What opportunities for training and professional development has the project provided?

These trials have strengthened the co-PIs ability to work effectively with organic grower and extension audiences.

How have the results been disseminated to communities of interest?

Reports have been (or will be where appropriate) published in either Arthropod Management Tests or Plant Disease Management Reports. Both are now open source and available outside the academic community. These reports are also linked to from the NYS IPM Program web site (https://nysipm.cornell.edu/environment/organic). Data from these trials has been incorporated into the Cornell Organic Guides for vegetable crops. These data have also been presented at numerous workshop, trainings and presentations to extension and grower audiences.
Seaman, A.J. NOFA NY Brassica Workshop. 10/30/14. Insect management on Brassica crops
Seaman, A. J. Organic efficacy trial update and discussion. Cornell Cooperative Extension Agriculture and Food Systems In-Service. November, 2014.
Seaman, A. J. Organic efficacy trial update and discussion. Cornell Cooperative Extension Agriculture and Food Systems In-Service. November, 2015.
Seaman, A. J. Managing Pests in Organic Sweet Corn. NOFA-NJ Winter Conference. 1/24/15
Seaman, A. J. OMRI Listed Insecticides and Fungicides: How Well do they Work? NOFA-NJ Winter Conference. 1/25/15
Lange, H. W. Field trials utilizing products approved for organic use to control plant pathogens and insect pests. Cornell College of Agricultrue and Life Sciences Annual Pesticide Updates, Geneva and Ithaca. April, 2015.
Smart, C. D. 1 hour discussion with 40 growers about disease problems common during the 2015 growing season. Twilight meeting in Eden Valley, NY August 19, 2015.
Smart, C. D. Northern NY (Essex and Clinton counties) visit to six mixed vegetable growers suffering from many disease problems, including high tunnel problems. August 17-18, 2015. A 1 hour visit to each of six farms, talking with at least 1 grower per farm.
Smart, C. D. Geneva Community Garden Disease Discussion. May 20, 2015. 30 minute talk to 10 gardeners.
Smart, C. D. Webinar for beginning vegetable growers entitled 'Vegetable Diseases', March 12, 2014. This was a 1 hour webinar to about 30 participants.
Smart, C.D. Crop Consultant Meeting, December 1, 2016 Syracuse NY. Understanding and controlling diseases of cucurbits.
North Country Willsboro research farm summer growers meeting. Willsboro NY Aug 4, 2016. Vegetable disease management. 1.5 hour discussion with 15 growers and educators.
Smart, C.D. Canton summer growers meeting. Canton NY Aug 3, 2016. 1.5 hour discussion with 20 growers and educators.
Smart, C.D. Webinar for beginning vegetable growers entitled 'Vegetable Diseases', March 16, 2016. This was a 1 hour webinar to about 25 participants.
Smart, C.D. Western NY Veg Growers Meeting, Lockport NY March 1, 2016. Update on cucurbit and tomato diseases. 30 minute talk to 42 growers and extension educators.
Smart, C.D. Empire State Producers Expo. January 20, 2016, Syracuse NY. Managing cucurbit downy mildew. 30 minute talk to 80 growers and educators.
Smart, C.D. Empire State Producers Expo. January 19, 2016, Syracuse NY. New developments in managing black rot, downy mildew and Alternaria leaf spot in cole crops. 25 minute talk to 30 growers and educators.
Seaman, A.J. December 3, 2015. Cornell Seed Conference. Pest Management Products: Where Do They Fit In Organic Production Systems?
Seaman, A.J. December 15, 2015. Growing Pennsylvania's Organic Farms Conference. Vegetable Disease Pests: The Best Organic Management Options
Seaman, A.J. December 16, 2015. Growing Pennsylvania's Organic Farms Conference. Vegetable Insect Pests: The Best Organic Management Options
Seaman, A.J. August 31, 2016. Cornell Vegetable Program Fresh Market Vegetable Field Day. Disease Management in Organic Cucumber and Tomato Production

What do you plan to do during the next reporting period to accomplish the goals?

{Nothing to report}

Accession No. 1001267 **Project No. NYC-106401**

Participants

Actual FTE's for this Reporting Period

Role	Non-Students or faculty	Students with Staffing Roles			Computed Total by Role
		Undergraduate	Graduate	Post-Doctorate	
Scientist	0.1	0	0	0	0.1
Professional	0	0	0	0	0
Technical	0.2	0	0	0	0.2
Administrative	0	0	0	0	0
Other	0	0	0	0	0
Computed Total	0.3	0	0	0	0.3

Student Count by Classification of Instructional Programs (CIP) Code

{NO DATA ENTERED}

Target Audience

Target audiences reached during this project include farmers, Cornell Cooperative Extension colleagues and Extension colleagues from other Northeast states, crop consultants, and undergraduate and graduate students.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2017	YES

Citation

H.W. Lange, C.D. Smart, and A.J. Seaman. 2017. Evaluation of materials allowed for organic production on downy mildew of cucumber, 2016. Submitted to Plant Disease Management Reports.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2017	YES

Citation

H.W. Lange, C.D. Smart, and A.J. Seaman. 2017. Evaluation of materials allowed for organic production on powdery mildew of zucchini, 2016. Submitted to Plant Disease Management Reports.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2017	YES

Citation

H.W. Lange, C.D. Smart, and A.J. Seaman. 2017. Evaluation of materials allowed for organic production on bacterial speck of tomato, 2016. Submitted to Plant Disease Management Reports.

Other Products

Accession No. 1001267	Project No. NYC-106401

Product Type

Data and Research Material

Description

We conducted trials and analyzed data, wrote publications, and gave presentations on the results of trials that created efficacy data for insecticides and fungicides allowed for organic production. This data will benefit organic vegetable growers and Cooperative Extension educators in New York and other Northeastern states as well as Ontario, Canada.

Changes/Problems

{Nothing to report}